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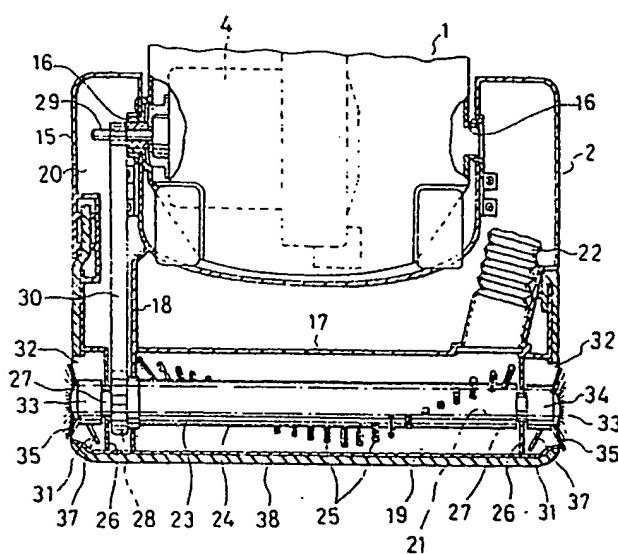
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(54) Floor nozzle for vacuum cleaner.

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FIG. 3



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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
X	DE-U-7 018 880 (VORWERK) * figures 2, 6, positions 10, 10'; claims 1-3 *	1-4, 12	A 47 L 9/04
X	---		
X	DE-A-3 012 685 (HITACHI) * figures 4, 5, 7, position 114; claims 1-4 *	1-4, 12	
X	---		
X	US-A-4 219 902 (DE MAAGD) * figure 3, positions 16, 27; claims 1-3 *	1-4	
A	---		
A	GB-A-2 019 715 (VORWERK) * claim 1 *	1	

			A 47 L 9/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	04-11-1988	SCHLAITZ J
CATEGORY OF CITED DOCUMENTS		
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		
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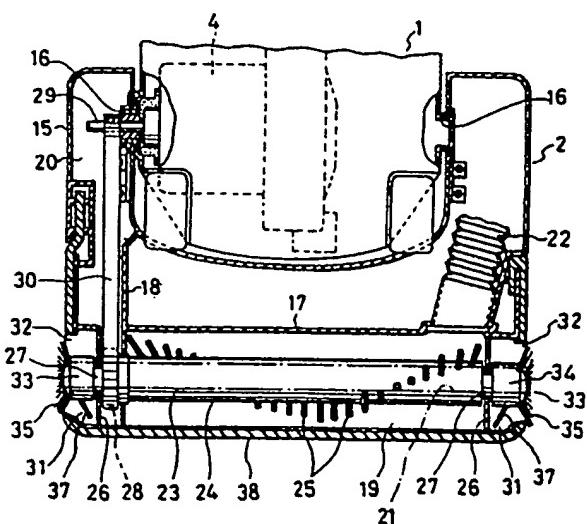
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FIG. 3



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Floor nozzle for vacuum cleaner

FIELD OF THE INVENTION AND RELATED ART STATEMENT

1. FIELD OF THE INVENTION

The present invention relates to a vacuum cleaner having a floor nozzle with rotating brushes.

2. DESCRIPTION OF THE RELATED ART

Since it has been difficult to perfectly suck dusts on a carpeting etc. (hereinafter is merely referred as a carpet) to be cleaned by only suction air flow from a simple passive floor nozzle by a fan motor of a vacuum cleaner, a floor nozzle having one or plural rotating brushes has been used in order to improve sucking ability for the carpet. These rotating brushes actively brush the carpet thereby to remove the dusts from piles of the carpet, so that the dusts are carried together with sucking air to a dust bag of the vacuum cleaner. These conventional floor nozzle of the vacuum cleaner comprises a nozzle at the bottom of a nozzle case, the rotating brushes in the nozzle compartment which is connected to the nozzle, and a motor or an air turbine as driving means of the rotating brushes. Hereupon, since both end portions of a shaft of the rotating brushes are rotatably held by bearings upon the nozzle case, there exist regions having no brush in both end parts of the bottom of the nozzle case. Therefore, it is difficult to brush edges of a room, and thereby the room cannot be cleaned perfectly. In order to overcome the above-mentioned shortcomings, auxiliary rotating brushes can be provided with connected with each end of the shaft of the rotating brushes. However, since these auxiliary rotating brushes are still inside the nozzle case, the edges of the carpet cannot be cleaned perfectly anyway.

OBJECT AND SUMMARY OF THE INVENTION

The object of the present invention is to provide an improved floor nozzle for vacuum cleaner which is capable of sucking dusts even on any edges and corners of the carpet to be cleaned.

In order to achieve the above-mentioned object, a floor nozzle for vacuum cleaner in accordance with the present invention comprises:

a nozzle case having a nozzle on the bottom thereof, an aperture which is formed on at least one side face of the nozzle case to the bottom and

a suction compartment therein;

driving means;

a main brush which is to be rotated by the driving means in the suction compartment and tips of which are projected out of the nozzle; and

at least one auxiliary brush which is connected to an end of the main brush and positioned to fit on the aperture.

The above-mentioned floor nozzle for vacuum cleaner can clean up the carpet completely without remaining dusts on any edges and corners thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG.1 is a perspective view showing a vacuum cleaner which has a floor nozzle of an embodiment of the present invention.

FIG.2 is a cross-sectional view of FIG.1.

FIG.3 is a sectional bottom view of the floor nozzle of FIG.2.

FIG.4 is a sectional view taken on a sectional plane IV-IV shown in FIG.2 of the floor nozzle of FIG.2.

FIG.5 is a partial cross-sectional view of the floor nozzle taken on a sectional plane V-V shown in FIG.2.

FIG.6 is a partial perspective view showing a floor nozzle of another embodiment of the present invention.

FIGs.7, 8 and 9 are partial side views of floor nozzles of still other embodiments of the present invention.

FIG.10 is a perspective view showing an auxiliary rotating brush of still another embodiment of the present invention.

FIG.11 is a cross-sectional view showing an auxiliary rotating brush of still another embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Hereafter, a preferred embodiment of the present invention is described with reference to the accompanying drawings. FIGs.1-5 show an embodiment of an upright type vacuum cleaner. FIG.1 and FIG.2 show a perspective view and a cross-sectional view, respectively. In these figures, a floor nozzle 2 is pivotably held by a body 1 of the vacuum cleaner. The body 1 holds a handle 3, which is extending upward, and has a fan motor 4 therein. An air-permeable partition 5 sections an inner space of the body 1 thereby to form a dust

catching compartment 6 at a suction side of the fan motor 4, namely inner upper of the body 1. The dust catching compartment 6 can be opened by detaching a front cover 7 from the body 1. A suction pipe 9 penetrates through a rear panel 8 of the dust catching compartment 6 and is fixed thereon. An opening 11 of a dust filter bag 10 is connected with an end of the suction pipe 9 within the dust catching compartment 6. Plural slits 12 are formed on the body 1 in order to exhaust air from the fan motor 4. In the floor nozzle 2, the nozzle case 15 is formed by coupling an upper case 13 and a lower case 14. A rear part 13a of the nozzle case 15 is formed into a concave configuration so as to surround front and both sides of lower part of the body 1, and is pivotably held by a shaft 16 (FIG.3). FIG.3 shows a sectional bottom view of the floor nozzle 2. An inner space of the nozzle case 15 is sectioned into a suction compartment 19 and a belt compartment 20 by partitions 17 and 18. As shown in FIG.2, the suction compartment 19 is connected to the nozzle 21, which is formed oblong in the widthwise direction (perpendicular direction to a sheet of the figure) of the lower case 14, and the dust filter bag 10 via a hose 22 which is connected to the partition 17 (FIG.3) at an end thereof and the suction pipe 9 (FIG.2) at the other end thereof. In FIG.3, a main rotating brush 23 comprises a cylindrical rotor 24 and plural brushes which are spirally provided on a circumference of the rotor 24. Both end portions of the rotor 24 are held by supporting walls 26 via bearings 27. Tips of the brushes 25 are slightly projected out of the nozzle 21 in order to brush the carpet to be cleaned. A pulley 28 which is fixed to one end portion of the rotor 24 in the belt compartment 20 is driven by a spindle 29 of the fan motor 4, which is projected into the belt compartment 20 and is held by the shaft 16, via a belt 30. And thereby, the main rotating brush 23 is rotated. Side compartments 31 are formed at both ends of the main rotating brush 23 in both sides of the nozzle case 15. A bottom part of the compartment 31 is opened to the nozzle 21 (FIG.2) and both sides of that is opened to the outside. In FIG.3, an auxiliary rotating brush 33 comprises a cylindrical rotor 34 and plural brushes 35 provided on a circumference of the rotor 34. A pair of auxiliary rotating brushes 33 are driven by a linkage with the ends of the main rotating brush 23, and the brushes 35 are arranged to form a conical configuration which opens outward in an aperture 32. FIG.4 and FIG.5 show a sectional view taken on a sectional plane IV-IV shown in FIG.2 and a partial cross-sectional view of the floor nozzle 2 taken on a sectional plane V-V shown in FIG.4, respectively. The main rotating brush 23 and the auxiliary rotating brushes 33 are rotated to the direction shown by an arrow 60, and

thereby the dusts on the carpet are brushed up to the suction compartment 19. The supporting wall 26 has a vent 36 for guiding the dusts from the side compartment 31 to the suction compartment 19 and a guide wall 37 inner upper end part of the side compartment 31 for smoothly guiding the dusts to the vent 36. A bumper 38 which is made of rubber is provided to surround circumference of the floor nozzle 2 so as not to get damaged upon the floor nozzle 2.

In the above-mentioned construction, cleaning operation by rotating the main rotating brush 23 and the auxiliary rotating brushes 33 together with the fan motor 4 is described. In FIGS.2 and 3, the dusts on the carpet are sucked by the fan motor 4 from the nozzle 21 and the compartment 31, and the air containing the dusts is flowed through the suction compartment 19, the hose 22, the suction pipe 9 and to the dust filter bag 10 in this order. In the dust filter bag 10, the dusts are filtered off, and thereby only purified air is passed through the fan motor 4 and exhausted out of the slits 12. The main rotating brush 23 and the auxiliary brushes 33 serve to brush the dusts out of the carpet thereby to put the dusts on the suction air.

Next, how the auxiliary rotating brushes 33 operate is described. In FIGS.3 or 4, the auxiliary rotating brushes 33 are disposed in the apertures 32 of the nozzle case 15 so as to fit on the substantially same surface as the side of the nozzle case 15. And thereby, the dusts on the edges or corners of the carpet in the room are surely brushed up. Therefore, uncleared part does not remain on the carpet.

Hereupon, the apertures 32 are provided at both sides of the nozzle case 15 unlike the disposition of the nozzle 21. In general, performance of the floor nozzle 2 is determined by quantity of the suction air from the nozzle 21. Therefore, to provide the apertures 32 which are not facing to the carpet is to form another current of suction air, namely a bypass of air, and thereby the quantity of the suction air from the nozzle 21 is decreased, and thereby the performance of the floor nozzle 2 is lowered. However, in this embodiment of the invention, since the auxiliary rotating brushes 33 are positioned in the way of suction air on the apertures 32, and thereby air-flowing from the apertures 32 is restricted below such negligible quantity that brings substantially no lowering of the performance of the floor nozzle 2. The dusts which are brushed off by the auxiliary rotating brushes 33 are carried by the current of suction air from a lower part of the compartment 31, via a vent 36, to the suction compartment 19. At that time, the guide wall 37 serves to aid flowing of the dusts to the vent 36. Thus, the floor nozzle 2 of this embodiment enables to clean any edges and corners of

the carpet completely with high performance for sucking dusts. In the above embodiment, although the auxiliary rotating brushes 33 are provided on both sides of the nozzle case 15, the auxiliary rotating brush 33 may be provided on only one side of that. Further, the floor nozzle 2 having the auxiliary rotating brush 33 is applicable not only to upright type cleaner but also to a cleaner whose body is connected with a floor nozzle via a hose and a pipe.

FIG.6 shows a partial perspective view of another embodiment of the floor nozzle. In the figure, plural brushes 35 are provided on the rotor 34 spirally of an axis direction of the rotor 34 so as to form a screw face. According to this embodiment, the dusts are brushed off and flicked off into the aperture 32, and thereby failure of dust-catching can be decreased. This auxiliary brush 33 also operates as a suction fan, and thereby suction power of the floor nozzle 2 is increased as a whole.

Hereafter, another embodiment of the floor nozzle wherein safety against possible injury etc. is improved is described. FIG.7 shows a partial side view of the floor nozzle of still another embodiment. In the figure, a center of the auxiliary rotating brush 33 is positioned with a slight shift from a center of the aperture 32 toward rear side (right side of the figure), thereby to form a gap 39 between the nozzle case 15 and the brush 33. According to this construction, even if a child inserts his finger to the aperture 32 out of mischief and the finger is caught by the brush 33, the finger is soon released by carrying it into the gap 39. Therefore, injury of the finger is avoidable.

FIG.8 shows a partial side view of the floor nozzle of still another embodiment. In the figure, a rib 40 is provided on the nozzle case 15 so as to project to the inner rear side of the auxiliary rotating brush 35. According to this construction, even if the child inserts his finger to the aperture 32, the rib 40 prevents the finger from catching in. Therefore, high safety can be presented.

FIG.9 shows a partial side view of the floor nozzle of still another embodiment. In the figure, a cut-off part 32 is formed on the nozzle case 15 by indenting from the aperture 32. And, this cut-off part 32 is covered by a bumper which is made of such an elastic material as rubber. According to this embodiment, even if the child inserts his finger to the aperture 32 and the finger is caught by the auxiliary rotating brush 33, the finger can be released from the brush 33 to the cut-off part 41 by deformation of the bumper 38. And thereby, injury of the finger is prevented. Also, since the cut-off part 41 is usually covered by the bumper 38, increase of the bypassing suction air which lowers the performance of the floor nozzle is not generated.

In the floor nozzle having the auxiliary rotating brush 33, the auxiliary rotating brush 33 sometimes catches the edges of the carpet, and the brush 33 is locked thereby. Under this state, the fan motor comes to have an overload, and thereby the fan motor may get damaged by an overheat thereof or the belt 30 may be burned off by slipping between the spindle 29 (FIG.3) and the belt 30 (FIG.3). FIG.10 shows a perspective view of the auxiliary rotating brush of still another embodiment. The main rotating brush 23 has a shaft 43 whereon a plane part 43a and a groove 43b are formed. The rotor 34 of the auxiliary rotating brush 33 has a cylindrical boss 44 with a cut-off part 44a thereon. A leaf spring 45 is held by the rotor 34 at both ends thereof and is pushed on the cut-off part 44a. When the rotor 34 is inserted to the shaft 43, the cylindrical boss 44 is fitted on the shaft 43 and the leaf spring 45 pushes the plane part 43a thereby to catch the shaft 43. An C shaped or e-shaped ring 42 is inserted in the groove 43b so that the rotor 34 does not come off out of the shaft 43. Normally, the auxiliary rotating brush 33, hence the rotor 34, is driven by a torque which is transmitted via the leaf spring from the shaft 43, and thereby the auxiliary rotating brush 33 rotates together with the main rotating brush 23. When the auxiliary rotating brush 23 is locked by catching the edges of the carpet and thereby a required torque comes to above a predetermined value, rotation of the shaft 43 deforms the leaf spring 45 and the shaft 43 is disconnected from the auxiliary rotating brush 33. Thereby, the main rotating brush 23 can continue to rotate alone. That is, the leaf spring 45 serves as a torque limiter which protects the fan motor 4 (FIG.3) or the belt 30 (FIG.3) from the damage given by a trouble of the auxiliary rotating brush 33.

FIG.11 shows a cross-sectional view of still another embodiment of the auxiliary rotating brush. In the figure, a rotor 47 has a hollow 48 therein and an offset part 49 in the middle thereof. Auxiliary rotating brush 50 is held tightly in a channel member 51, and this channel is put in a pit 52 which is formed in the side of the rotor 47 with a predetermined inclination. A cap 53 is inserted into the rotor 47 and a hook 55 thereof is engaged with the offset part 49 of the rotor 47. The channel member 51 is fixed between the pit 52 and a tapered surface 56 which is formed on the cap 51, and thereby the brush 50 is aligned toward the circumference of the cap 53, and tips 50a of the brush 50 are projected out of the circumference of the cap 53. According to this embodiment, since almost all of the aperture 32 is covered by the cap 53, safety is remarkably improved and the bypassing suction air can be minimized. Further, since the tips 50a of the brush 50 reach the carpet over the circum-

ference of the cap 53, even the dusts on the edges of the carpet are completely brushed and cleaned. Furthermore, when the brush 50 is worn, it can be exchanged easily by removing the cap 53 from the rotor 47. That is, maintenance of the brush 50 is easy.

While specific embodiments of the invention have been illustrated and described herein, it is realized that other modifications and changes will occur to those skilled in the art. It is therefore to be understood that the appended claims are intended to cover all modifications and changes as fall within the true spirit and scope of the invention.

Claims

1. A floor nozzle for vacuum cleaner comprising:

a nozzle case (15) having a nozzle (21) on the bottom thereof, an aperture (32) which is formed on at least one side face of the nozzle case (15) to said bottom and a suction compartment (19+31) therein;

driving means (30);

a main brush (23) which is to be rotated by said driving means (30) in said suction compartment (19+31) and tips of which are projected out of said nozzle (21); and

at least one auxiliary brush (33) which is connected to an end of said main brush (23) and positioned to fit on said aperture (32).

2. A floor nozzle for vacuum cleaner in accordance with claim 1, wherein

said suction compartment (19+31) is sectioned into a main suction compartment (19) for said main brush (23) and at least one auxiliary suction compartment (31) for said auxiliary brush (33) by a partition (26) which has a vent (36) for guiding dusts containing air from said auxiliary suction compartment (31) to said main suction compartment (19).

3. A floor nozzle for vacuum cleaner in accordance with claim 2, further comprising

a guide (37) which is formed in said auxiliary suction compartment (31) for guiding the air with dusts into said vent (36).

4. A floor nozzle for vacuum cleaner in accordance with claim 1, wherein

said auxiliary brush (33) is provided spirally in an axis-direction of rotation thereof.

5. A floor nozzle for vacuum cleaner in accordance with claim 1, wherein

said auxiliary brush (33) has a diameter for substantially closing said aperture (32).

6. A floor nozzle for vacuum cleaner in accordance with claim 1, wherein

said auxiliary brush (33) has a conical configuration which opens outward from said aperture (32).

7. A floor nozzle for vacuum cleaner in accordance with claim 1, further comprising

catch-prevention means for fingers in the rotation of said auxiliary brush (33).

8. A floor nozzle for vacuum cleaner in accordance with claim 7, wherein

said catch-prevention means is a rib (40) which is projected in a rear half of said aperture (32).

9. A floor nozzle for vacuum cleaner in accordance with claim 1, wherein

said nozzle case (15) has a refusing space (39 or 41) for protecting fingers against the catch in rotation of said auxiliary brush (33).

10. A floor nozzle for vacuum cleaner in accordance with claim 9, wherein

said refusing space is a gap (39) which is formed by shifting a center of said auxiliary brush (33) from a center of said aperture (32).

11. A floor nozzle for vacuum cleaner in accordance with claim 9, wherein

said refusing space is a cut-off part (41) which is indented from said aperture (32).

12. A floor nozzle for vacuum cleaner comprising:

a nozzle case (15) having a nozzle (21) on the bottom thereof, an aperture (32) which is formed on at least one side face of the nozzle case (15) to said bottom and a suction compartment (19+31) therein;

driving means (30);

a main brush (23) which is to be rotated by said driving means (30) in said suction compartment (19+31) and tips of which are projected out of said nozzle (21); and

at least one auxiliary brush (33) which is connected to an end of said main brush (23) via a torque limiter and positioned to fit on said aperture (32).

13. A floor nozzle for vacuum cleaner in accordance with claim 12, wherein

said torque limiter comprises a partly-plane cylindrical shaft (43) of said main brush (23) and a rotor (34) of said auxiliary brush (33) having a partly-cut-off cylindrical pipe (44) whereon a leaf spring (45) is urged.

14. A floor nozzle for vacuum cleaner comprising:

a nozzle case (15) having a nozzle (21) on the bottom thereof, an aperture (32) which is formed on at least one side face of the nozzle case (15) to said bottom and a suction compartment (19+31) therein;

driving means (30);

a main brush (23) which is to be rotated by said driving means (30) in said suction compartment (19 + 31) and tips of which are projected out of said nozzle (21);

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at least one auxiliary brush (50) which is connected to an end of said main brush (23) and positioned to fit on said aperture (32); and

a cap (53) which is engaged with a rotor (47) of said auxiliary brush (50) thereby to hold said auxiliary brush (50) inbetween and to cover said aperture (32).

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15. A floor nozzle for vacuum cleaner in accordance with claim 14, wherein

said cap (53) has a tapered surface (56) for aligning said auxiliary brush (50).

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16. A floor nozzle for vacuum cleaner in accordance with claim 14, wherein

said cap (53) substantially closes said aperture (32).

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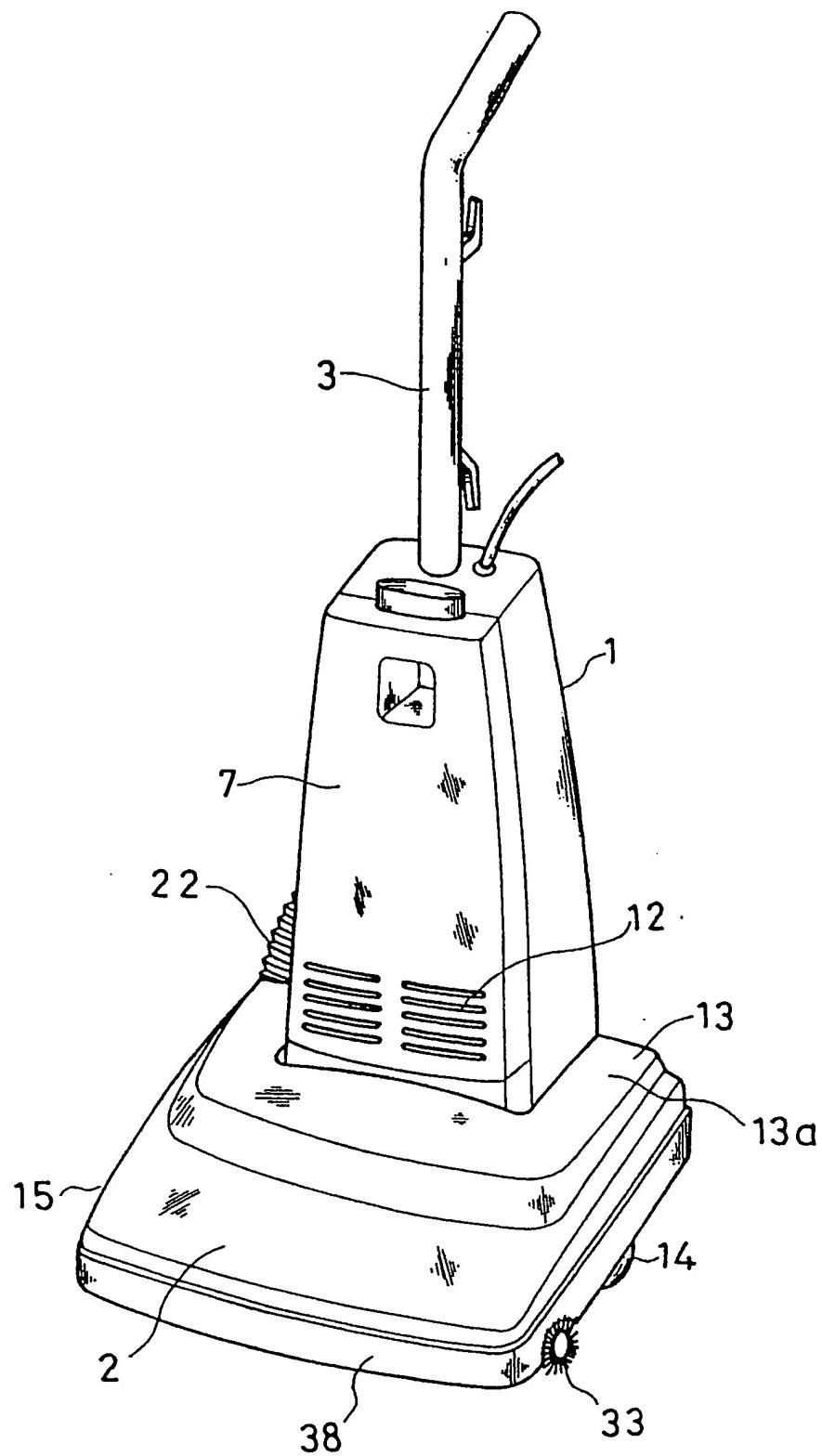
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FIG. 1



F I G. 2

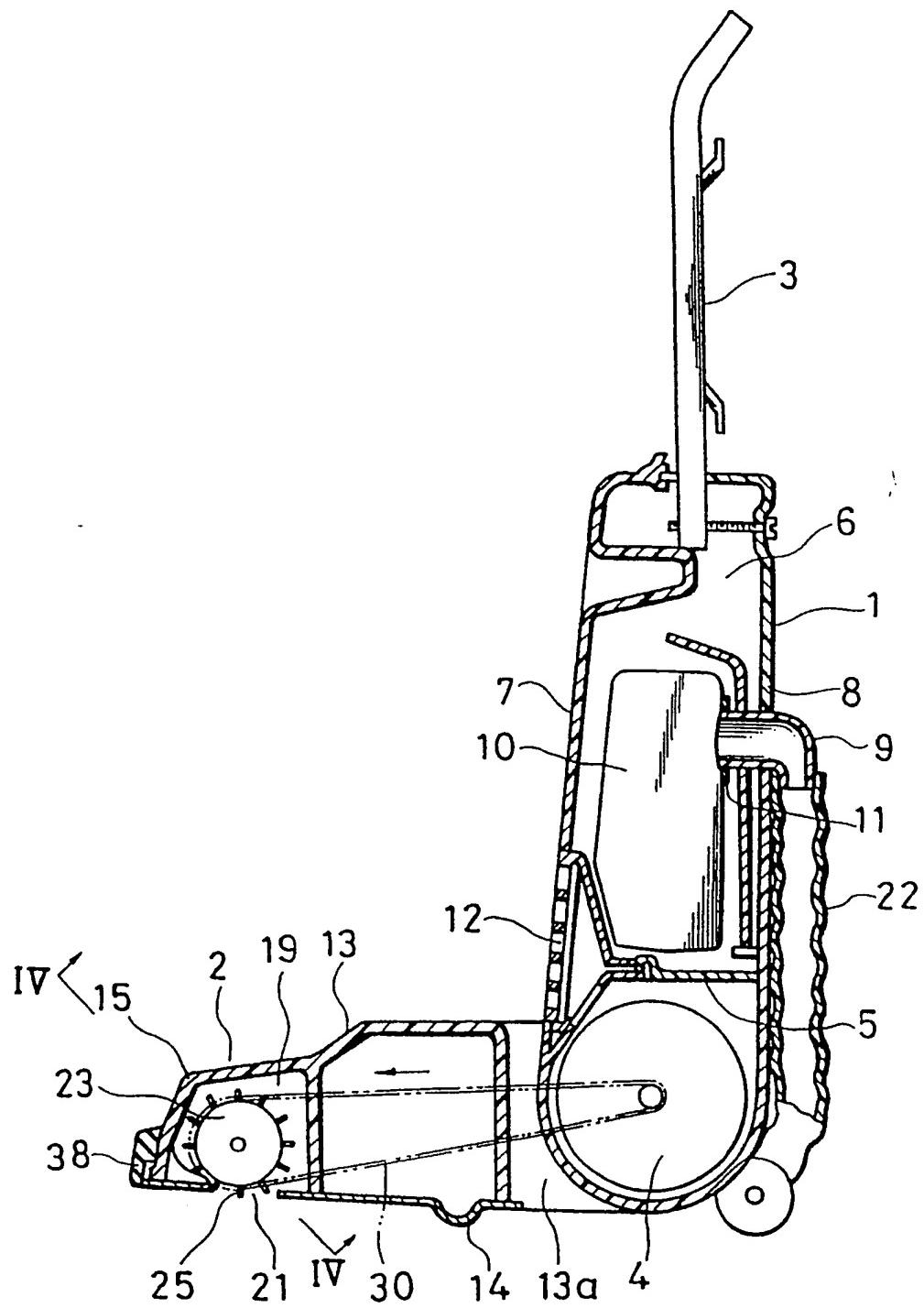


FIG. 3

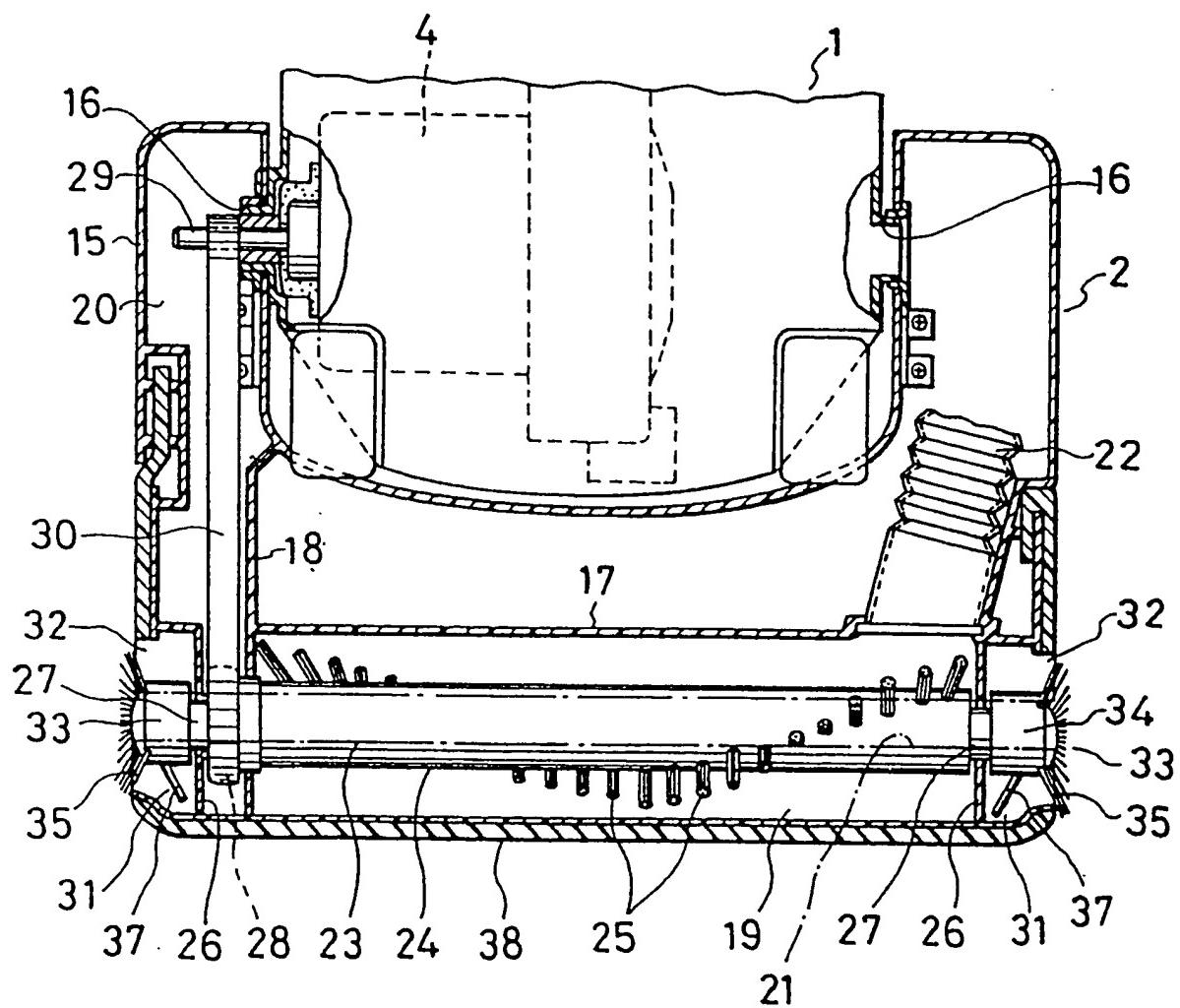


FIG. 4

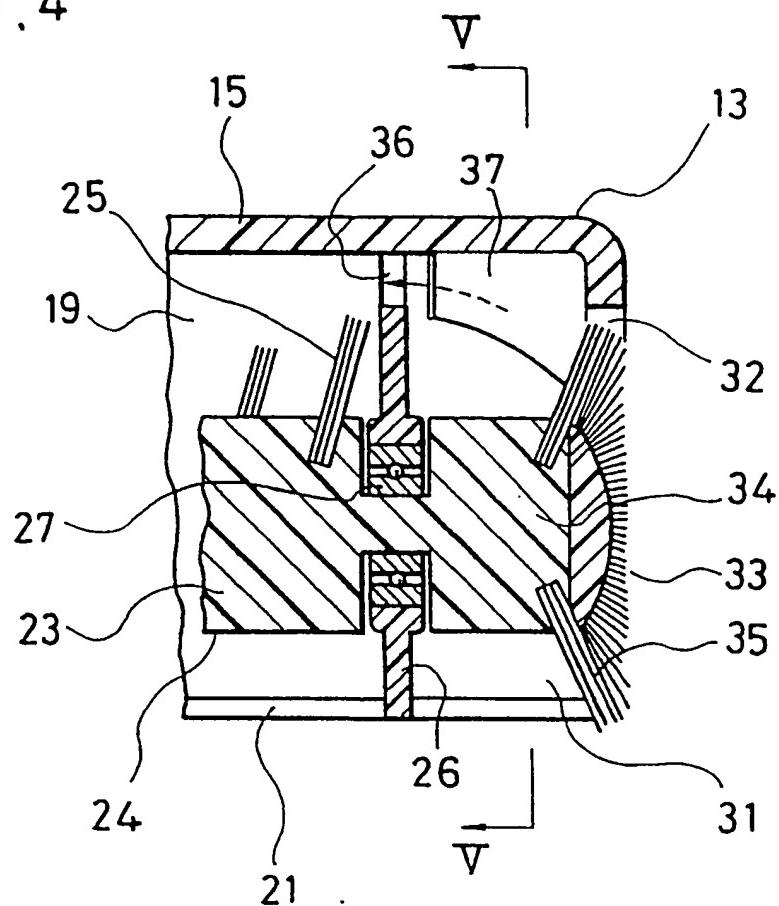


FIG. 5

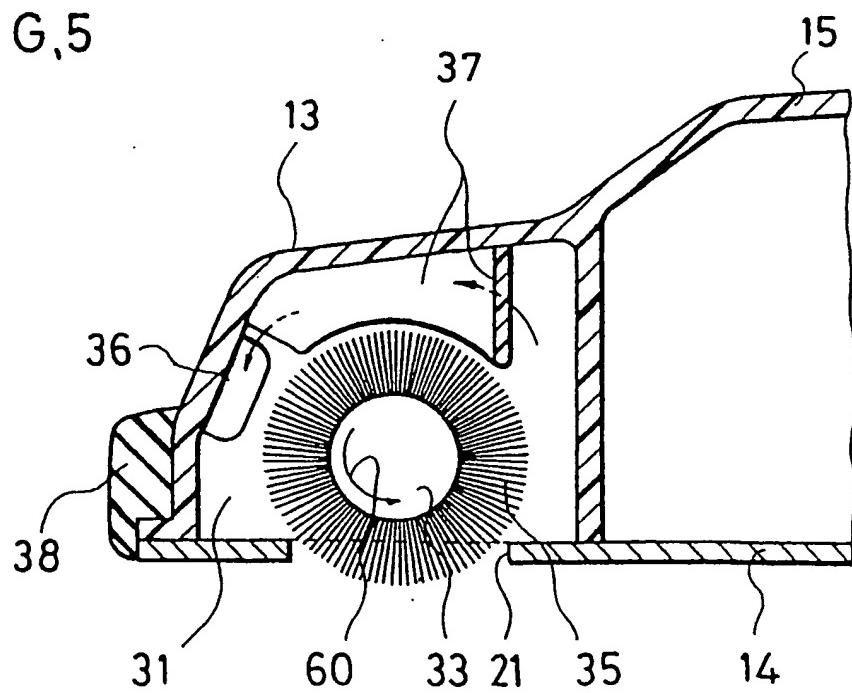


FIG. 6

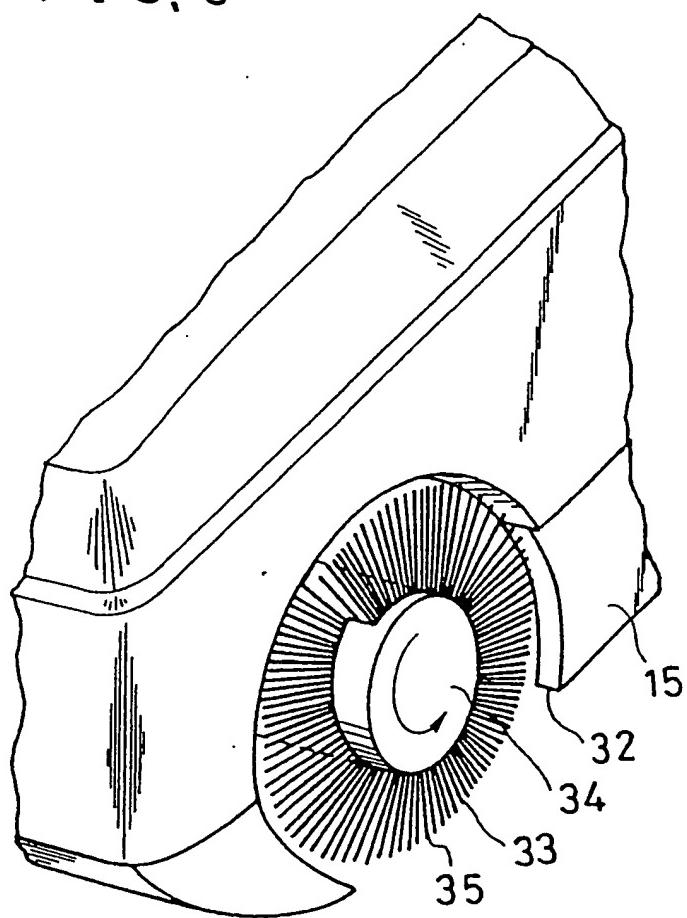


FIG.7

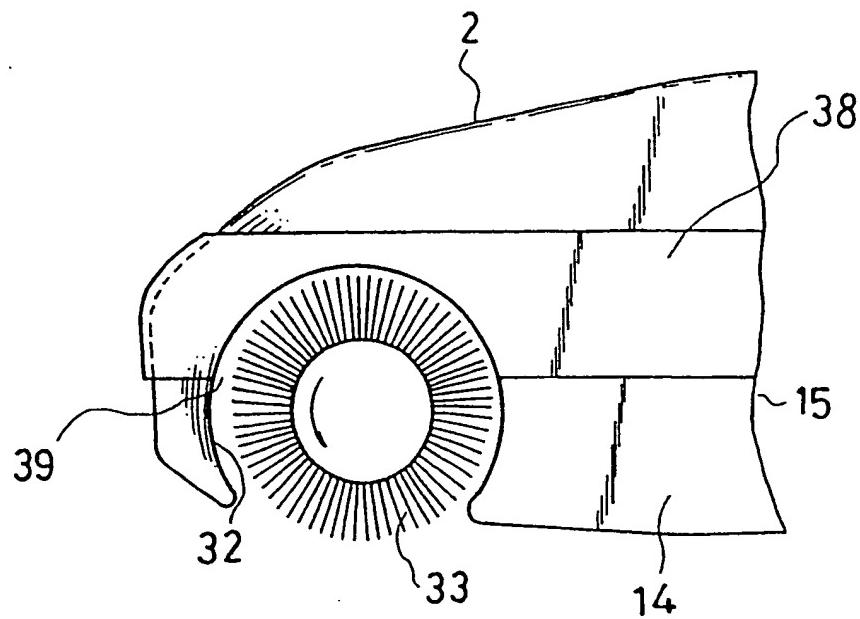


FIG.8

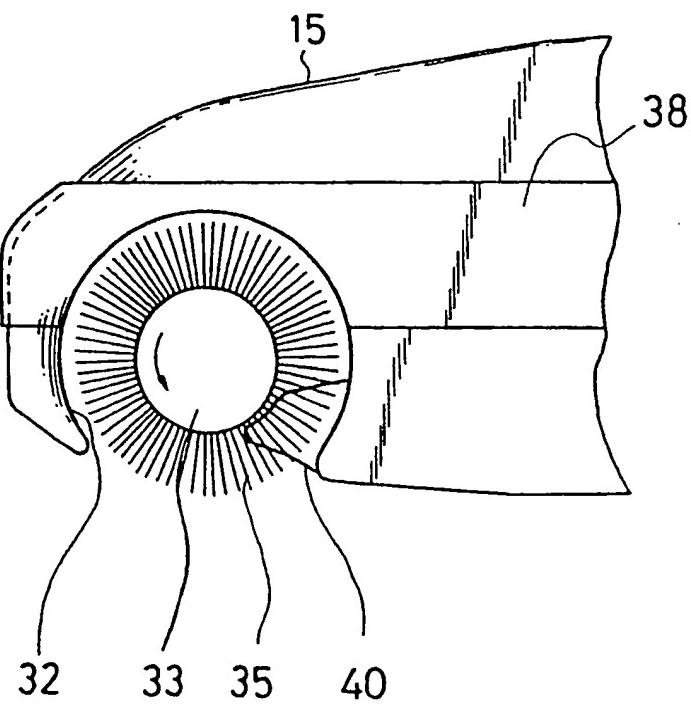


FIG. 9

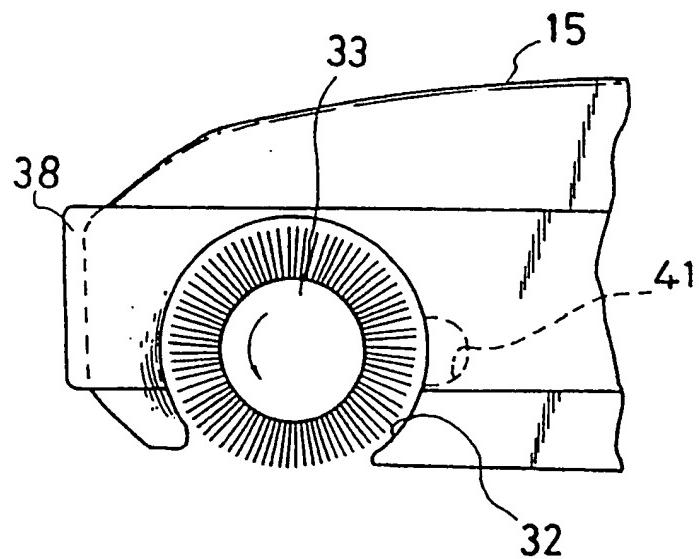


FIG. 10

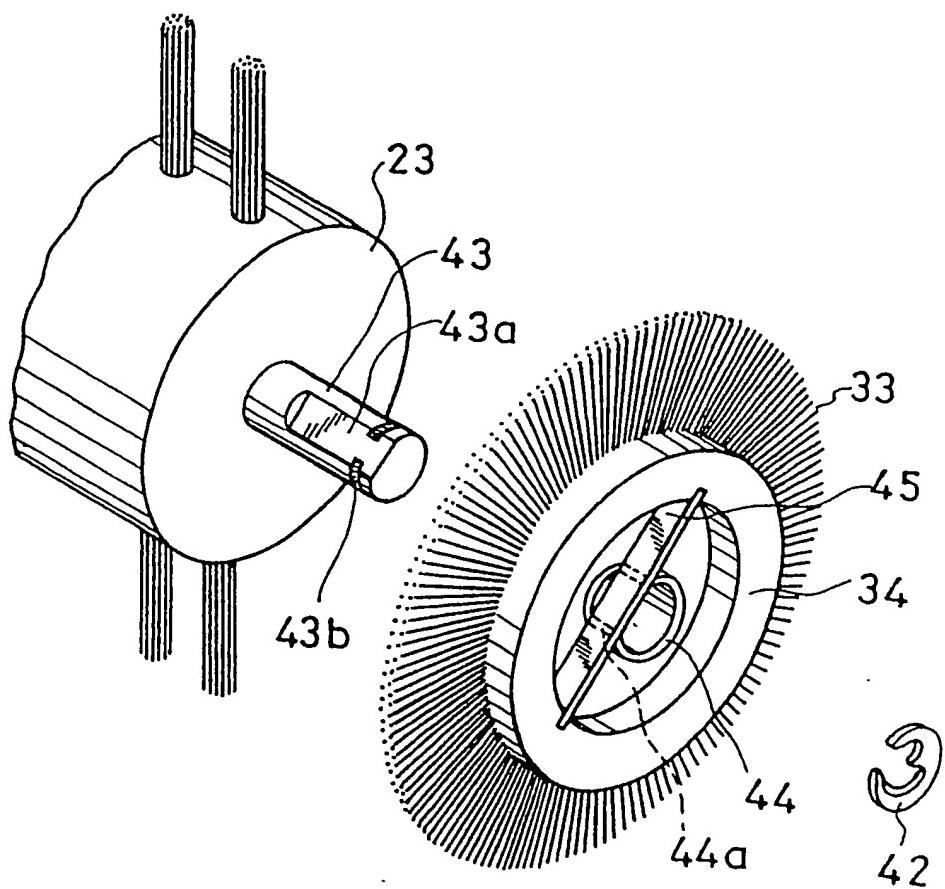
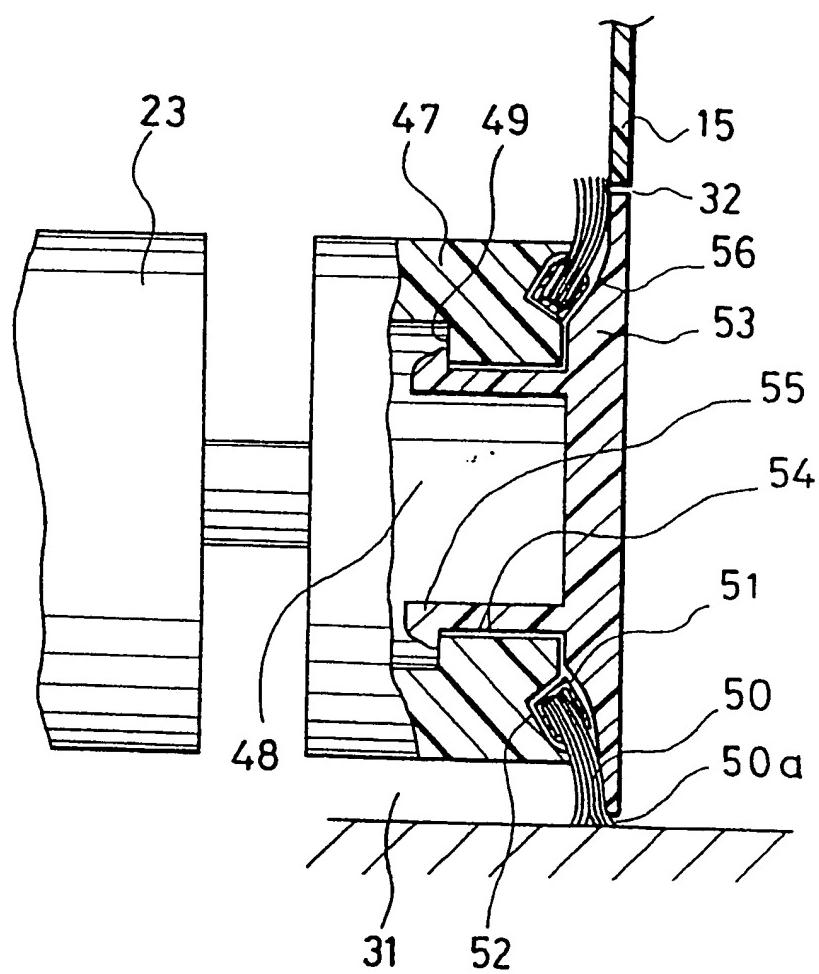


FIG. 11



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